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Report to the Chairman, Subcommittee on National Parks and Public Lands, Committee on Interior and Insular Affairs, House of Representatives

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PARKS AND RECREATION

Maintenance and Reconstruction Backlog on National Forest Trails

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GAO

United States
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Resources, Community, and
Economic Development Division

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The Honorable Bruce F. Vento
Chairman, Subcommittee on National
Parks and Public Lands
Committee on Interior and Insular Affairs
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we review the Forest Service's trail system. The report assesses the current extent of the trail maintenance and reconstruction backlog as measured in both dollars and miles of trails. In addition, it discusses Forest Service efforts to deal with the backlog, planned new trail construction, and trail rights-of-way.

Copies of this report are also being sent to the Secretary of Agriculture. We will also make copies available to others upon request.

This report was prepared under the direction of James Duffus III, Director, Natural Resources Management Issues (202) 275-7756. Other major contributors are listed in appendix IV.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

In 1987, the Forest Service reported a $100 million backlog of trail maintenance and reconstruction work on the basis of 1983 inventory information. The Chairman, Subcommittee on National Parks and Public Lands, House Committee on Interior and Insular Affairs, expressed concern that deferred trail maintenance was resulting in decreased recreational opportunities, resource damage, and loss of major capital investments. The Chairman asked GAO to determine the extent, cause, and effects of the Service's trail maintenance and reconstruction backlog, and also asked GAO to obtain information on Service efforts to deal with the backlog, and new trail construction needs.

Background

National forests contain about 106,750 miles of trails, many of which existed long before national forests were established. The original functions of the trails were as trade and travel routes, and later they were used by the Forest Service for access to and management of the national forests. Following World War II, the trail system began to deteriorate as roads and airstrips replaced trails. Beginning in the 1960s, while the trail system was deteriorating, recreational use of the system was increasing. Over the last 20 years, recreational trail use has more than doubled, and in 1987, almost 30 million recreation visitor days were spent on national forest trails for activities such as hiking, biking, and horseback riding.

Once built, forest trails must be maintained, or in some cases reconstructed, to keep them in good condition. From fiscal year 1981 through fiscal year 1987, funding for the Service's trail program was insufficient to accomplish all the needed maintenance and reconstruction work. Concerned about the deterioration of forest trails, the Congress increased funding for the trails from about $19.7 million in fiscal year 1987 to about $36.1 million in fiscal year 1988.

Results in Brief

In responding to GAO's questionnaire sent to all 121 Forest Service units, Service supervisors told GAO that as of September 30, 1988, the unmet maintenance and reconstruction backlog on the trail system totaled about $195 million. Insufficient funding and lack of personnel were cited as the primary causes of this backlog.

GAO used a questionnaire to gather these data because they were not centrally available at Forest Service headquarters. Without having periodic data on the number of trail miles needing maintenance or reconstruction, the severity of the trail conditions, or associated cost

estimates, neither the Service nor the Congress can measure, with any degree of accuracy, the size and severity of the trail maintenance and reconstruction backlog, the progress made in reducing the backlog, or the funds needed to do so.

To compensate for insufficient funds and personnel, the Forest Service makes extensive use of volunteers and supplements its funding with outside sources, such as cost-sharing programs and grants. These efforts, while helpful, have costs and limitations, and are unlikely to close the gap between the resources needed and the resources available.

The forest supervisors told GAO that their forest plans called for constructing about 8,400 miles of new trails over the next 5 years at an estimated cost of about $60 million. Given current funding levels and the need to reconstruct existing trails, however, only about one-third of the planned miles may be built during this period.

Principal Findings

Extent, Cause, and Effects of the Backlog

Forest supervisors reported that the trail maintenance and reconstruction backlog involved about 59,000 miles of trails. Of the 121 forest units, 11 accounted for $91 million, or about half, of the reported backlog cost.

Limited funding, according to the forest supervisors, was the primary cause of the trail maintenance and reconstruction backlog. Funding has fluctuated over the past decade and, according to the forest supervisors, has consistently been less than needed to keep the trails in good condition.

When maintenance is deferred, trails can deteriorate to the point of being unusable or dangerous. According to forest supervisors, about 5,000 miles of trails were unusable as of September 1988 because of deferred maintenance. Other effects of deferred maintenance include resource damage and trails not maintained up to standard.

The Service Has Limited Data on Trail Conditions

Service headquarters annually gathers and reports to the Congress the number of miles of trails maintained and constructed during the year. However, it does not routinely gather data on maintenance and reconstruction needs or the associated costs, nor does it categorize needs by severity of trail condition. Without such information, Service management and the Congress cannot monitor the backlog or prioritize trail maintenance and reconstruction funding needs. Additionally, the Service's new computerized information system, to be operational in 1990, is not planned to gather such data.

Forest Service Efforts to Deal With the Backlog

To deal with the trail maintenance and reconstruction backlog, the Service has used volunteers and outside funding sources. The Service reported that in fiscal year 1988, volunteers worked about 926,000 hours to maintain and reconstruct over 17,600 miles of forest trails. The use of volunteers, though effective, has associated costs and other limitations. For example, Service personnel must train and supervise volunteers, and the quality of volunteers' work varies.

Funds from outside sources also help the Service compensate for limited funds. For years, user groups, clubs, and state governments have contributed funds for trail maintenance and construction. For example, in fiscal year 1988, the Service received about $2.5 million in such contributions.

Planned New Trail Construction

In addition to its trail maintenance and reconstruction needs, the Service has plans to construct nearly 8,400 miles of new trails over the next 5 years, at an estimated cost of nearly $60 million. However, on the basis of fiscal year 1989 funding levels and historical expenditure patterns, only about $20 million of the $60 million needed for the new trail miles planned for the next 5 years will be available during that period.

Recommendation

To enable the Service and the Congress to monitor the trail maintenance and reconstruction backlog and to prioritize trail program funding decisions, GAO recommends that the Secretary of Agriculture direct the Chief of the Forest Service to gather and make available to the Congress, on a periodic basis, nationwide data on the trail maintenance and reconstruction work that needs to be done, the severity of conditions requiring the work, and the associated costs. The Service's new computerized information system may serve as a useful vehicle by which the Service could gather and report these data.

Agency Comments

GAO obtained the views of officials directly responsible for the program and incorporated their comments in the report where appropriate. Forest Service headquarters officials said that they generally concurred with GAO's recommendation. However, at the request of the Subcommittee Chairman, GAO did not obtain written comments from the Service.

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Abbreviations

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Introduction

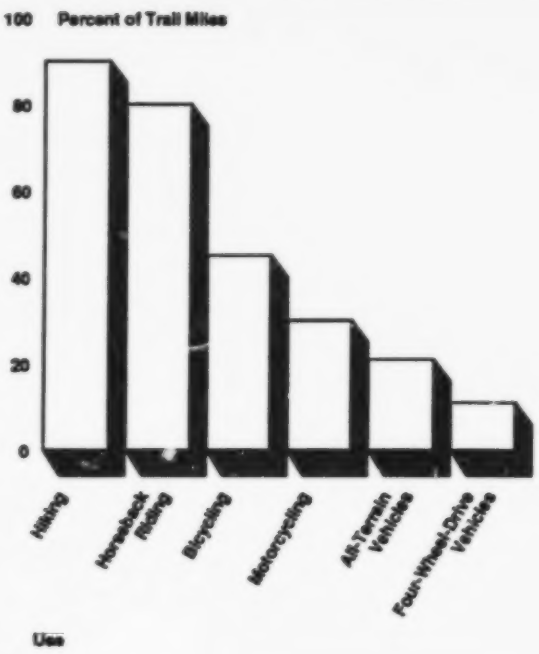
The national forests contain about 106,750 miles of trails. The Forest Service, in the U.S. Department of Agriculture, is responsible for building and maintaining these forest trails. The trails are primarily used for recreation, although they are also used by the Service for fire-fighting and forest management. Trails are designed for various users. For example, interpretive trails (which provide information on the surrounding forest, animals and their habitats, etc.) are designed for forest visitors who want a short, easy, educational, recreational experience. In contrast, trails in congressionally designated wilderness areas are generally more difficult and challenging. Some long trails, such as the Appalachian Trail (a congressionally designated National Scenic Trail that stretches from Maine to Georgia), are not entirely on Forest Service land, but traverse National Park Service, state, and private land as well.

Trails are used for diverse recreational activities, including hiking, horseback riding, bicycling, motorcycling, and riding all-terrain vehicles. Figure 1.1 shows the percentage of trail miles available for these various uses. According to the Forest Service, trail use has nearly doubled over the last 20 years; in fiscal year 1987 (the latest year for which data were available), about 29.6 million recreation-visitor-days were spent on national forest trails.[1]

Once built, the trails must be maintained or, in some cases, reconstructed to keep them in good condition. However, from fiscal year 1981 through 1987, the Forest Service's maintenance budget was at levels that resulted in the deferral of much maintenance work. The budget reductions and maintenance deferrals, according to the Deputy Chief, National Forest Systems, were necessary to reduce the federal deficit. In response to users' concerns about deteriorating forest trails, the Congress requested that the Forest Service identify the extent of its trail maintenance and reconstruction backlog. In 1987, the Service reported that it would cost nearly $100 million to eliminate the backlog. However, it should be noted that this figure was based on 1983 inventory information.

[1] A recreation-visitor-day is equivalent to 12 hours of trail use by 1 person.

Figure 1.1: Percentage of Forest Service Trail Miles Available for Various Types of Use



Source: Forest supervisors' responses to GAO's questionnaire

Evolution of the Forest Service Trail System

An extensive network of trails existed long before national forests were established. Some trails were established by Native Americans as trade and travel routes; others were made by prospectors, herders, and game. Since the passage of the Forest Reserve Act in 1891, which authorized the establishment of forest reserves, our national forests have grown to encompass more than 186 million acres.

In the early days of the Forest Service, ranger districts were very large, and the trail system was the rangers' major means of access, by foot or pack mule, for forest management, patrol, and fire suppression. The rangers' use of the trails supplemented and gradually replaced the original trail uses.

By the mid-1940s, largely owing to the efforts of the Civilian Conservation Corps, national forest trail mileage reached a peak of about 144,000 miles. Between 1930 and World War II, over 20,000 miles of trails had

been added to the system, and many of the original trails were rebuilt to higher standards. Although roads and bridges were concurrently being developed, the trails remained a major means of access to the backcountry of the national forests. Throughout this period, access for forest management purposes remained the prime justification for the continuing investments in trails.

Following World War II, however, the trail system began to deteriorate. Roads and airstrips replaced trails for many administrative, patrol, and fire suppression purposes, and recreational users were few in number. Accordingly, new trails were not built, and existing trails were not maintained.

Beginning in the 1960s, while the trail network was deteriorating, recreational use of the network was increasing. In the 1960s, and increasingly throughout the 1970s and 1980s, the primary use of the trail network has been recreational.

Funding for Trail Maintenance and Construction

From fiscal year 1980 through fiscal year 1987, funding for trail maintenance and construction has not been at consistent levels: the maintenance budget (in 1989 dollars) ranged from $10.5 million to $18.7 million; and the construction budget ranged from $4.8 million to $12.2 million.[2]

In fiscal years 1988 and 1989, as a result of the Service's reported backlog, the Congress increased funding. For fiscal years 1988 and 1989, the Service received $36.1 million and $36.7 million, respectively (in 1989 dollars), for trail maintenance and construction, nearly double the funds received in fiscal year 1987. Appendix III shows the budget history of Forest Service trail maintenance and construction funding for fiscal years 1980 through 1989, in 1989 dollars.

Objectives, Scope, and Methodology

On February 4, 1988, the Chairman, Subcommittee on National Parks and Public Lands, House Committee on Interior and Insular Affairs, asked us to obtain information on the Forest Service's trail maintenance backlog. The Chairman expressed concern that deferred trail maintenance was resulting in decreased recreational opportunities, resource damage, and the loss of major capital investments.

[2]Reconstruction is funded out of the construction budget. According to the Forest Service, 75 to 80 percent of the construction budget is spent on reconstruction of existing trails.

As subsequently agreed with the Chairman's office, we

- determined the extent, cause, and effects of the Service's trail maintenance and reconstruction backlog;
- identified Service efforts to deal with the backlog; and
- identified new trail construction needs.

In addition, we also agreed to provide a brief description of trail rights-of-way problems. (See app. I.)

Because the Forest Service is decentralized, most data and knowledge of the trails reside at the individual forests. Even at this level, however, the extent and type of information readily available varies. Much information, while known by a forest's recreation staff, is not documented.

Because trail data are not available at Forest Service headquarters, we developed a questionnaire to obtain current information about trail conditions at all national forests. The questionnaire requested information on (1) trail inventory and funding, (2) trail maintenance, reconstruction, and new construction, (3) the causes of trail maintenance and reconstruction backlogs, (4) volunteer programs and other initiatives associated with the forest trail network, (5) trail rights-of-way issues, (6) the types and extent of resource damage due to deferred trail maintenance, and (7) trail problems and positive examples of trail management. Responses were based on available data and professional judgment.

We pretested the questionnaire at seven national forest administrative units in three regions. After modifying the questionnaire to reflect suggested changes and recommendations obtained during the pretest, we distributed it to forest supervisors of all 121 national forest administrative units identified in the Forest Service's June 1988 organizational directory. These administrative units cover all 149 national forests in the United States and Puerto Rico.

We received responses from the 121 forest supervisors surveyed. Table 1.1 shows, by Forest Service region, the administrative units surveyed and the number of forests under each unit's management.

Table 1.1: Summary of Questionnaire Responses by Region

Region number[a] and name	Number of administrative units surveyed	Number of forests under unit management
1-Northern	13	13
2-Rocky Mountain	12	16
3-Southwestern	11	12
4-Intermountain	16	18
5-Pacific Southwest	17	17
6-Pacific Northwest	19	21
8-Southern	15	34
9-Eastern	14	16
10-Alaska	4	2
Total	**121**	**149**

[a]Because of a reorganization in the 1960s, there is no Forest Service region 7. Accordingly, all subsequent tables listing Forest Service regions will not contain a region 7.

Although all 121 units responded to the questionnaire, some did not respond to every question. In some cases, according to respondents, data were not readily available to complete each question. About 90 percent of the questionnaires, however, were complete. The information provided in this report is based on the responses received for each question.

To supplement the questionnaire responses, we interviewed Forest Service staff responsible for administering trails at Service headquarters, 5 of the Service's 9 regional offices, and 15 national forests. Within each regional office and national forest visited, we reviewed pertinent documents and records and interviewed staff who manage trails. We selected the five regions for review because they (1) collectively contain one-half of the trail mileage in national forests, (2) have a diversity of trails (e.g., remote wilderness, urban interface, and national scenic, historic, or recreation trails) and climatic conditions, and (3) provide extensive geographic coverage. Figure 1.2 shows the five regions visited, as well as the miles of trails in each region.

Within each of the five regions, we visited at least two forests. We selected forests on the basis of our discussions with Service headquarters and regional personnel, again seeking a diversity of trail types and conditions as well as funding levels and associated maintenance backlogs. Within the 15 national forests we visited, we also met with district rangers and other service personnel familiar with trail maintenance and construction issues. In addition, we hiked numerous trails to observe and document trail conditions. Table 1.2 lists the national forests visited.

Figure 1.2: Forest Service Regions Visited and Miles of Trails per Region

Source: Forest Service

Table 1.2: National Forests Visited by GAO

National forest	State	Forest Service region
Arapaho	Colorado	Rocky Mountain
Chippewa	Minnesota	Eastern
Cibola	New Mexico	Southwestern
Coronado	Arizona	Southwestern
Daniel Boone	Kentucky	Southern
Gifford Pinchot	Washington	Pacific Northwest
Mt Baker	Washington	Pacific Northwest
Pike	Colorado	Rocky Mountain
Pisgah	North Carolina	Southern
Roosevelt	Colorado	Rocky Mountain
San Isabel	Colorado	Rocky Mountain
San Juan	Colorado	Rocky Mountain
Shoshone	Wyoming	Rocky Mountain
Superior	Minnesota	Eastern
White Mountain	New Hampshire	Eastern

We also interviewed representatives of three national trail user groups (the American Hiking Society, the Appalachian Mountain Club, and American Trails) to obtain their opinions and concerns about Forest Service trail conditions.

To gain an understanding of the type and extent of trail data reported to Forest Service headquarters and to the Congress, we reviewed annual budget and appropriations documents as well as the Service's plans for its computerized resource information management system for trails.

We conducted our review between May 1988 and April 1989 in accordance with generally accepted government auditing standards. We obtained the views of Forest Service officials responsible for the trail program and incorporated their comments in the report where appropriate. However, at the request of the Subcommittee Chairman, we did not obtain official comments on this report from the Forest Service.

Information on the Trail Maintenance and Reconstruction Backlog Is Not Routinely Reported

Forest Service headquarters annually gathers and reports to the Congress, by state, the total number of forest trail miles, as well as the number of miles maintained and constructed during the year. However, it does not gather or report data on trail conditions, unmet maintenance and reconstruction needs, and associated costs. Although the Service plans to have a new automated trail management information system operational in 1990, this system will not include information on trail conditions, unmet maintenance and reconstruction needs, and the associated costs. Without such information, neither Forest Service headquarters nor the Congress can monitor the overall condition of the national trail system or measure the size and severity of the trail maintenance and reconstruction backlog.

Because Forest Service headquarters does not gather or maintain overall data on the condition of its trail system, including the extent, cause, and effects of the trail maintenance and reconstruction backlog, we sent a questionnaire to all 121 forest supervisors. As of September 30, 1988, according to the questionnaire respondents, the Forest Service had a trail maintenance and reconstruction backlog of about $195 million, involving 58,955 miles of trails. The respondents attributed the backlog primarily to limited funding over the past decade, exacerbated by a loss of personnel and related expertise. The effects of deferred maintenance, according to the respondents, range in severity from safety and health hazards to minor trail damage. Because the extent and type of records varied at the forest level, questionnaire responses were based on a combination of available records and professional judgment.

Headquarters Does Not Require Forest Units to Report Trail Maintenance Needs and Cost Data

Forest Service headquarters does not routinely obtain information on the condition of trails that require maintenance or reconstruction work. It also does not routinely obtain estimates of the costs of addressing unmet trail maintenance and reconstruction needs. Regional officials told us that it would be feasible to report trail maintenance and reconstruction needs by priority (i.e., by severity of trail condition) to Forest Service headquarters, since this knowledge generally exists at the forest units.

Each of the 15 national forests we visited maintained some form of trail inventory. The accuracy and completeness of this information, however, varied from forest to forest. The most complete trail inventory system we found was at the Stanton ranger district in the Daniel Boone National Forest, Kentucky. This system, covering about 70 miles of trail, contained a detailed trail inventory, including trail logs, photographs, and

inspection and maintenance records. Each trail log described the trail and contained information on all structures (e.g., bridges and steps) on the trail. Photographs of all trail structures are maintained and cross-referenced to the trail logs. The inspection and maintenance records listed the trail conditions noted during each trail's annual inspection, the maintenance needs observed, and the priority and associated cost of maintenance tasks. Completed maintenance tasks were also recorded.

In fiscal year 1990, according to Forest Service officials, a new computerized trail inventory system will be operational. Through the Recreation Information Management Trail System, the Forest Service plans to systematically gather data on the nationwide Forest Service trail system. The system will gather national data, by trail, on the number of trail miles comprising the trail network (by state, county, region, and forest). It will also obtain data on the number of miles maintained to standard. In addition to the required data, regional and district offices can include optional data such as the degree of trail difficulty, frequency of maintenance, and type of trail surface.

Although the new system will gather data on the number of miles maintained to standard, it will not gather data on the remaining trail miles' condition, resulting maintenance needs, and associated costs. Without recurring data on trail maintenance and reconstruction needs and costs, neither the Service nor the Congress can measure the size and severity of the trail maintenance and reconstruction backlog, the progress made in eliminating the backlog, or the additional funds needed to do so.

Reported Extent, Cause, and Effects of the Maintenance and Reconstruction Backlog

In responding to our questionnaire, the forest supervisors provided us information and insights concerning the extent, cause, and effects of the existing trail maintenance and reconstruction backlog. The questionnaire responses indicated that as of September 30, 1988, the Forest Service had a maintenance and reconstruction backlog of about $195 million, with almost half of the backlog concentrated in 11 forest units. The major cause of the backlog was reported to be funding limitations, and many forests also reported that a lack of personnel contributed to the backlog. The reported effects of deferred maintenance included health and safety hazards, trail closures, resource damage, and trails that were not being maintained up to standards.

Extent of the Backlog

According to the forest supervisors, almost $195 million was needed as of September 30, 1988, to eliminate the maintenance and reconstruction

backlog, thereby bringing the 58,955 miles of trails up to design standard (i.e., the optimal trail condition). Appendix II provides examples of design standards for various types of trails. Table 2.1 shows, by region, the estimated trail miles and costs of the maintenance and reconstruction backlog.

Table 2.1: Forest Supervisors' Estimates of Maintenance and Reconstruction Backlogs, by Forest Service Region

	Maintenance backlog		Reconstruction backlog		Total backlog	
Region numbers and name	Miles	Cost	Miles	Cost	Miles	Cost
1-Northern	8,082	$2,631,200	7,028	$70,583,400	15,110	$73,214,600
2-Rocky Mountain	4,601	6,630,865	1,898	20,312,800	6,499	26,943,665
3-Southwestern	3,944	4,040,600	648	3,342,900	4,592	7,383,500
4-Intermountain	7,380	3,867,563	2,871	10,767,250	10,251	14,634,813
5-Pacific Southwest	4,673	9,771,036	2,194	17,808,700	6,867	27,579,736
6-Pacific Northwest	4,890	5,128,290	3,032	22,523,300	7,922	27,651,590
8-Southern	2,809	1,396,556	586	1,401,500	3,395	2,798,056
9-Eastern	2,874	1,931,190	787	2,364,600	3,661	4,295,790
10-Alaska	364	516,400	294	9,411,560	658	9,927,960
Total	**39,617**	**$35,913,700**	**19,338**	**$158,516,010**	**58,955**	**$194,429,710**

As shown in table 2.1, the Service's Northern region reported the largest trail maintenance and reconstruction backlog. According to regional forest officials, maintenance and reconstruction work is more difficult and expensive in the Northern region's forests for a variety of reasons. For example, many Northern trails are located in remote or wilderness areas. Trails in wilderness areas account for about a third of the region's total trail miles. Such locations not only pose access problems, but can also greatly increase costs because mechanized equipment is not generally permitted in wilderness areas. Additionally, many trails in the Northern region are located on fragile soil and are severely damaged by heavy use, especially by horses.

Trail structures in need of replacement also add considerably to reconstruction costs. For example, of the 27 cable suspension bridges in the Northern region, 10 need to be replaced, at a cost of about $50,000 each. Many trails also need blasting work (e.g., to clear rock slides), which requires several thousand drill holes per mile, in which the blast charges are placed. Blasting work, according to regional officials, can cost $30,000 per mile.

In discussing the backlog estimate with Forest Service headquarters officials, they told us that the backlog reported by region 1 appeared to be unusually high and that the amounts for regions 8 and 9 seemed somewhat low. They did not, however, have alternative estimates for these regions.

Of the 121 forest administrative units, 11 accounted for nearly half of the reported maintenance and reconstruction backlog cost. These 11 forest units, 6 of which are located in the northern region, reported about $91 million, or 47 percent, of the total reported backlog cost of $195 million. Table 2.2 shows, by state, the 11 forest administrative units with the largest reported costs.

Table 2.2: Forest Administrative Units With the Largest Reported Maintenance and Reconstruction Backlogs

Forest unit	State	Reported backlog
Nezperce	Idaho	$15,112,000
Clearwater	Idaho	13,123,000
Flathead	Montana	9,276,800
Idaho Panhandle	Idaho	8,431,000
Rio Grande	Colorado	7,800,000
Mt. Baker-Snoqualmie	Washington	6,762,000
Sierra	California	6,660,000
Stanislaus	California	6,570,000
Deerlodge	Montana	6,437,000
Gallatin	Montana	5,720,000
Shoshone	Wyoming	5,038,280
Total		**$90,930,080**

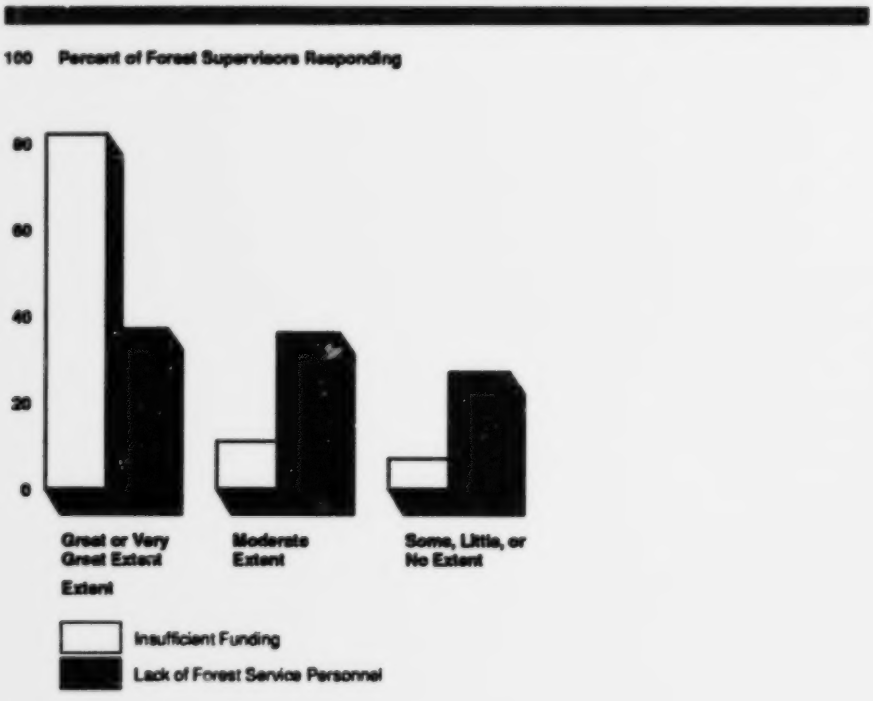
According to headquarters officials, these forests (except Mt. Baker-Snoqualmie, Sierra, and Stanislaus) receive relatively low use, and funding to address the backlog at these forests would not be cost-effective.

Funding Limitations Reported as the Major Cause of the Backlog

The supervisors in their questionnaire responses, as well as Service personnel we interviewed at headquarters, regions, and forests, cited limited funding as the major cause of deferred trail maintenance and reconstruction. According to Service personnel, funding levels over the past decade have consistently been less than needed to keep the trails in optimal condition. Also, because of the funding limitations, trail maintenance personnel have been transferred to other Forest Service programs that have more money, and not all positions lost because of attrition have been filled.

Our questionnaire asked forest supervisors to report the extent to which various factors contributed to deferred trail maintenance and reconstruction in their forests. Not all 121 supervisors provided information on each of the factors listed, as requested. However, for each factor listed, between 114 and 119 provided information. As shown in figure 2.1, 82 percent said that funding limitations contributed to a great or very great extent to the backlog, and about 37 percent said that a lack of Forest Service personnel contributed to a great or very great extent to the backlog. Other factors cited as contributing to the backlog, although to a lesser extent, included the low priority given to the trail program by headquarters, regions, and forest units, and not enough volunteers. According to headquarters officials, the fluctuating budgets over the last decade have also resulted in a declining pool of contractors available to maintain, repair, and construct trails.

Figure 2.1: Extent to Which Funding Limitations and Lack of Forest Service Personnel Contributed to the Trail Maintenance and Reconstruction Backlog

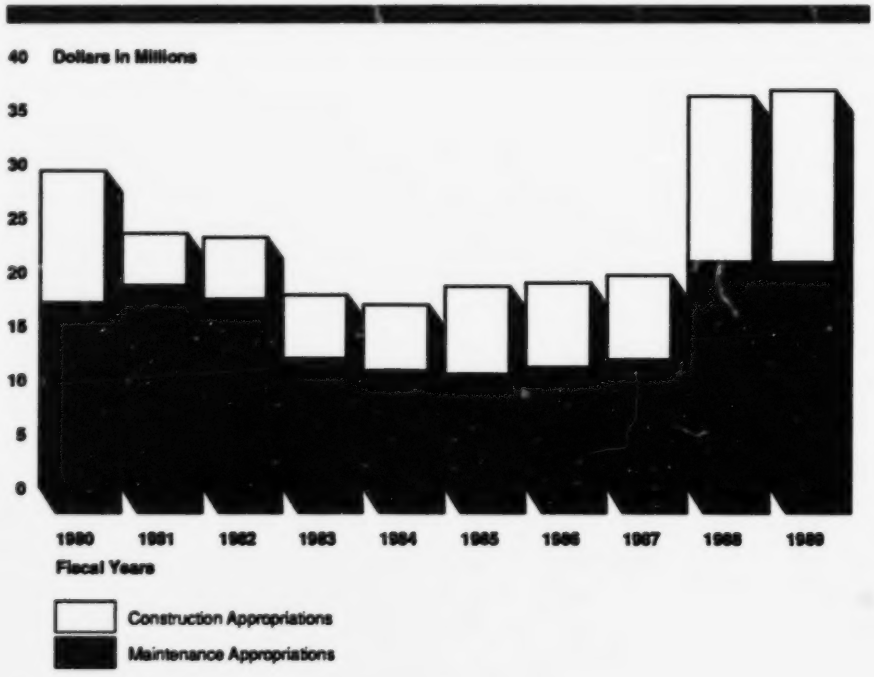


Source: Forest supervisors' responses to GAO's questionnaire

According to the Deputy Chief, National Forest System, the trail program, along with other recreation programs, received its share of budget cuts from 1981 to 1987 because of the nation's need to reduce the large federal deficit. As a result of the decreased budget, maintenance was deferred, and the backlog of deferred maintenance grew.

Concerned about the large maintenance and reconstruction backlog and users' complaints regarding the deteriorating condition of the forest trails, the Congress increased the Service's maintenance and construction budgets in fiscal years 1988 and 1989. With the congressional increases, the fiscal year 1988 budgets nearly doubled those of 1987. Together, the maintenance and construction budgets were increased from about $19.7 million in fiscal year 1987 to about $36.1 million in fiscal year 1988 and to about $36.7 million in fiscal year 1989. Figure 2.2 shows the trail maintenance and construction budgets for fiscal years 1980 through 1989.[1]

Figure 2.2: Forest Service Trail Maintenance and Trail Construction Appropriations—Fiscal Years 1980 Through 1989 (in Constant 1989 Dollars)

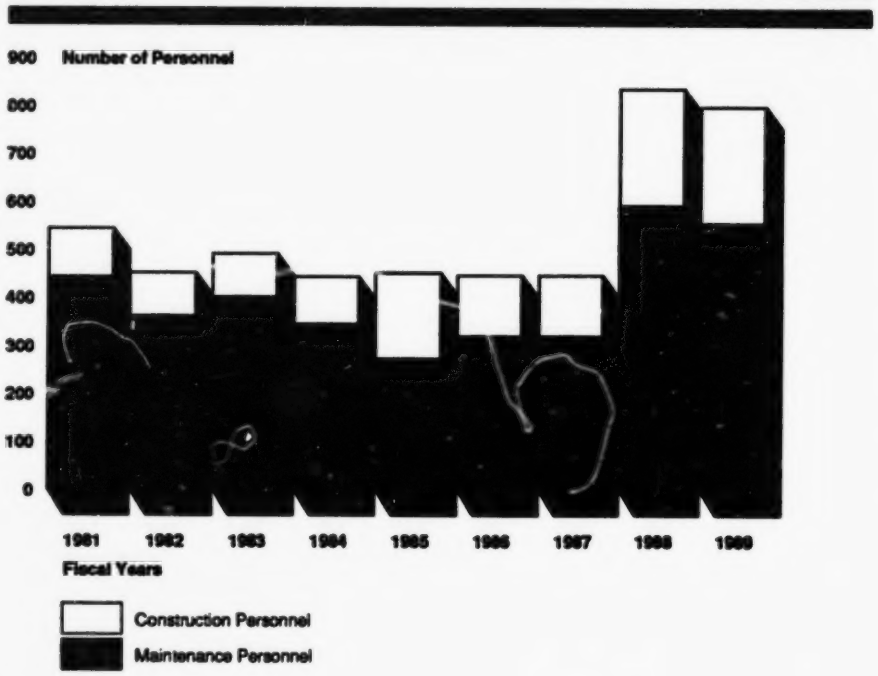


Source: Basic data provided by the Forest Service

[1] All dollar amounts are reported in 1989 dollars.

Along with limited funding, the Forest Service has sustained a loss of experienced trail personnel over the past decade. Figure 2.3 shows trail maintenance and construction personnel levels for fiscal years 1981 through 1989. In the forests we visited, Service personnel said that funding limitations during the 1980s resulted in the transferral of many maintenance personnel to other Forest Service programs. Additionally, position vacancies (e.g., for seasonal trail crews) were not filled.

Figure 2.3: Trail Maintenance and Construction Personnel— Fiscal Years 1981 Through 1989 (Full-time Equivalent Personnel)



Source: Forest Service.

Along with limited funding and a loss of experienced trail maintenance personnel, trail use has increased. According to the questionnaire respondents, recreational use of the trails increased by nearly 25 percent between fiscal years 1984 and 1988.

Effects of Deferred Maintenance

When maintenance is deferred, trails can become difficult to traverse, impassable, or even completely lost. As of September 30, 1988, according to the questionnaire respondents, about 5,200 miles of trails were unusable because maintenance had been deferred. In some cases, trails are closed because their maintenance needs are so expensive or continual. For example, if a trail is located near an area where avalanches are common, the maintenance costs may be prohibitive, given limited funds.

Without routine maintenance, the resource damage done by natural forces (e.g., rock slides, soil movement, blown-down trees, water erosion on the trail surface, growth of vegetation) goes uncorrected and can accelerate trail deterioration. Deferred maintenance can also result in safety and health hazards. For example, bridge timbers that are not maintained can rot and weaken, posing danger to users. Trees broken by wind can be caught up in other trees and, if not cut down by trail crews, can fall on trail users.

The Forest Service generally performs maintenance activities according to the priority of need. The three maintenance priorities are to eliminate safety and health hazards (priority 1), minimize unacceptable resource damage (priority 2), and fully restore a trail to its planned design standard (priority 3).

Priority 1: Eliminating Safety and Health Hazards

Forest Service personnel told us that even with limited funding, they have generally been able to take care of safety and health hazards as they are identified. In fiscal year 1988, according to questionnaire respondents, maintenance to correct safety and health hazards occurred on 7,440 miles of trails. Figure 2.4 shows an unsafe bridge we observed that needed replacement, and figure 2.5 shows the replacement bridge.

Priority 2: Minimizing Unacceptable Resource Damage

In fiscal year 1988, maintenance to minimize unacceptable resource damage occurred on about 17,320 miles of trails according to questionnaire respondents.

Figures 2.6 and 2.7 show examples of resource damage we observed. Figure 2.6 shows a trench caused by heavy trail use. The tape measure held by the Forest Service employee shows the trail's original height.

Figure 2.7 shows severe soil erosion on a trail in the Coronado National Forest, Arizona. Water easily damages the granite-based soil in this area.

Priority 3: Restoring a Trail to Its Planned Design Standard

The Service's third priority for trail maintenance is to fully restore trails to their planned design standards. In fiscal year 1988, such maintenance

occurred on about 9,286 miles of trails according to questionnaire respondents. Priority three maintenance generally involves such activities as cleaning and repairing drainage structures, cutting back vegetation, replacing or repairing trail markers and signs, and restoring trail surfaces. Figures 2.8 and 2.9 show trails we observed that need only routine maintenance.

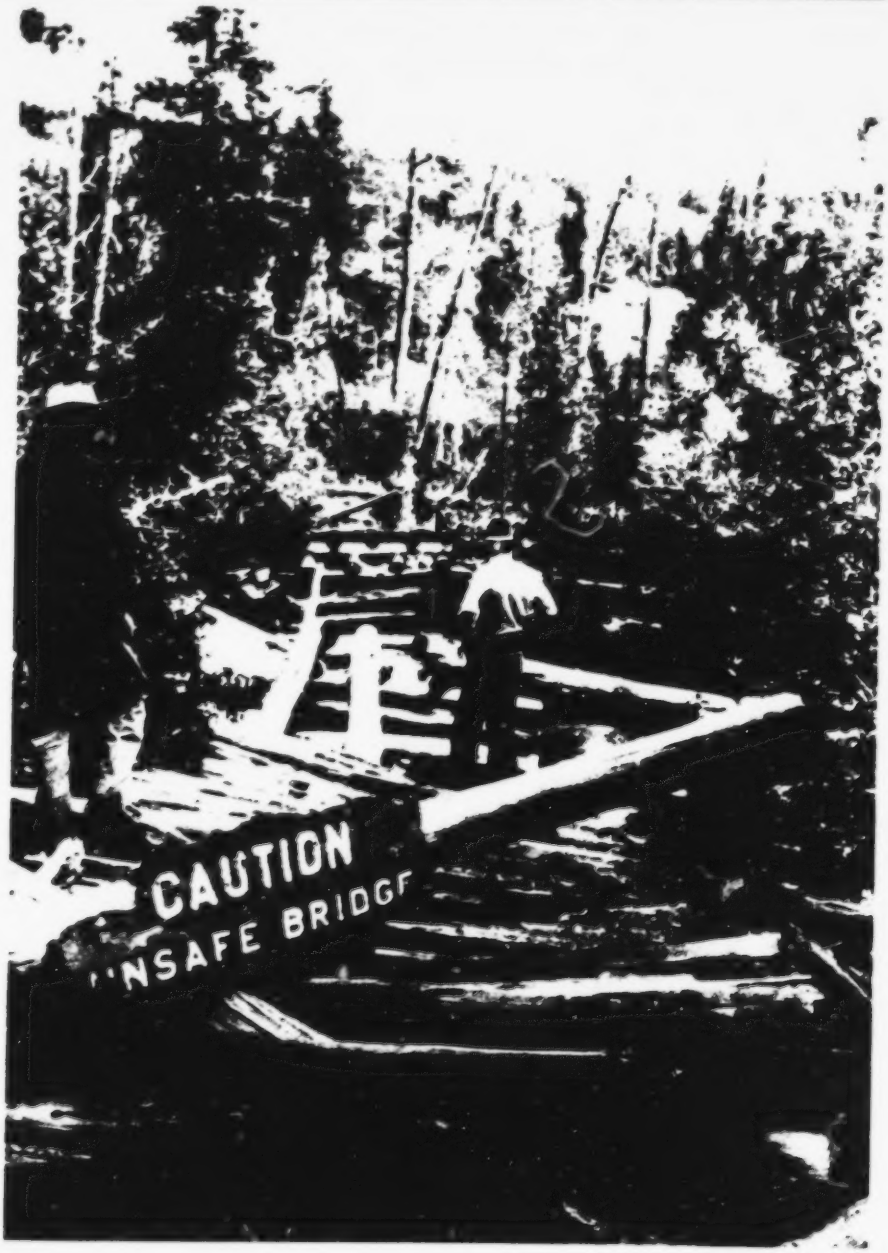


Figure 2.4: Unsafe Wooden Trail Bridge, Shoshone National Forest, Wyoming

Figure 2.5: Replacement Steel Bridge With Wood Decking, Shoshone National Forest, Wyoming

Figure 2.6: A Deeply Trenched Trail, Gifford Pinchot National Forest, Washington

Figure 2.7: Severe Soil Erosion on a Trail, Coronado National Forest, Arizona

Figure 2.8: A Horseback Riding Trail Needing Only Some Trimming of Vegetation, Pisgah National Forest, North Carolina

Figure 2.9: A Hiking Trail Needing Only Some Trimming of Vegetation, Mount Baker National Forest, Washington

Conclusions

Forest supervisors reported that, as of September 30, 1988, the trail maintenance and reconstruction backlog involved 58,955 miles of trails and about $195 million. They attributed the backlog to limited funding,

exacerbated by a loss of Service personnel and related expertise. The effects of the backlog can be classified according to the degree of the problem: (1) safety and health hazards, (2) unacceptable resource damage, and (3) routine maintenance needs.

Forest supervisors are generally the most knowledgeable about the condition of forest trails, the miles of trails needing maintenance or reconstruction, and the associated cost estimates. However, the extent to which this information is recorded in a systematic manner varies from forest to forest. Moreover, Service headquarters does not gather and compile this information for management purposes, and the Service does not anticipate that its new computerized information system will do so either. Without recurring data on trail maintenance and reconstruction needs and costs, neither the Service nor the Congress can measure the size and severity of the trail maintenance and reconstruction backlog, the progress made in eliminating the backlog, or the additional funds needed to do so.

We believe that such information would also be useful to the Congress in deciding on appropriations for the trail program, particularly in these times of tight budgetary constraints. For example, how much would it cost to eliminate health and safety hazards on trails? How much more would it cost to do the work needed to mitigate unacceptable resource damage on trails? And finally, how much more would it cost to do the routine maintenance work needed to fully restore trails to their optimal condition?

Recommendation

To enable the Service and the Congress to monitor the trail maintenance and reconstruction backlog and to prioritize trail program funding decisions, we recommend that the Secretary of Agriculture direct the Chief of the Forest Service to gather and make available to the Congress, on a periodic basis, nationwide data on (1) the trail maintenance and reconstruction work that needs to be done, (2) the severity of conditions requiring the work, and (3) the associated costs. The Service's new computerized information system may serve as a useful vehicle for gathering and reporting these data.

In discussing the results of our review with Service headquarters officials, they generally concurred with this recommendation.

Forest Service Efforts to Deal With the Backlog

To compensate for limited funds, the Forest Service uses other means to deal with the maintenance and reconstruction backlog. Many forest units make extensive use of volunteers to maintain trails. Other programs, such as cost-sharing and "Adopt-A-Trail," also help to fund and perform trail maintenance and reconstruction work. These programs, while helpful, have certain limitations and costs associated with them.

The Service Makes Extensive Use of Volunteers

Many Forest Service districts use volunteers—individuals and groups—to perform trail maintenance work, a practice that began in the early 1900s. In fiscal year 1988, according to the questionnaire respondents, volunteers worked about 926,000 hours on over 17,600 miles of forest trails. Table 3.1 shows, by Forest Service region, the hours worked by volunteers and the miles of trails involved in fiscal year 1988.

Table 3.1: Volunteer Hours and Miles of Trails Worked on in Fiscal Year 1988

Region number and name	Hours worked	Miles of trails
1-Northern	45,386	1,519
2-Rocky Mountain	125,082	2,239
3-Southwestern	34,110	717
4-Intermountain	64,075	3,008
5-Pacific Southwest	237,078	1,609
6-Pacific Northwest	124,536	2,389
8-Southern	191,435	2,707
9-Eastern	92,085	3,342
10-Alaska	12,415	81
Total	**926,202**	**17,611**

Volunteers' work is strenuous. They dig out stumps, remove blown-down trees, clear brush, trim vegetation, and repair erosion damage on trails. This work often requires volunteers to be in good physical condition and to be able to handle tools such as shovels, picks, axes, hoes, and saws.

There are several different ways volunteers can participate. For example, through the Adopt-A-Trail program, volunteers assume the responsibility for maintaining a trail or section of trail. The maintenance usually consists of clearing the trail and repairing erosion control structures; major problems are reported to the Forest Service for correction. Members of the Carolina Mountain Club, for example, have maintained sections of the Appalachian Trail in the Pisgah National Forest for over 50 years. For the past 10 years, the volunteers have assumed primary

responsibility for routine maintenance and assisted the Forest Service with heavy maintenance and reconstruction work.

Other volunteers may participate through various legislatively authorized programs. For example, the Volunteers in the National Forests Act of 1972 (P.L. 92-300), as amended, authorizes the Service to actively recruit, train, and supervise volunteers for service in the forests and to reimburse volunteers for food, lodging, and transportation. The act also provides for government payment of tort claims and compensation for injury.

Several human resource programs, while funded by other agencies, also provide volunteers to the Forest Service. For example, Forest Service-hosted human resource programs are funded by the Job Training Partnership Act of 1982 (P.L. 97-300) and the Carl D. Perkins Vocational Education Act of 1984 (P.L. 98-524). Other human resource programs hosted by the Service include the College Work-Study Program, the Work Incentive Program, the Community Work Experience Program, the Workfare Program, and the Vocational Rehabilitation Program.

Both the young and the old help to maintain the national forests. For example, the Touch America Project, funded by the American Forestry Association, recruits volunteers aged 14 to 17. Senior citizens, on the other hand, provide services through the Senior Conservation Employment Program, a cooperative program with the Department of Labor.

The Forest Service also obtains volunteers through partnership and joint-venture agreements. Such agreements specify the Service's contributions and those of the partner (e.g., a state or local civic organization or an employment and training agency). For example, the Forest Service may agree to provide supervision and equipment, while the partner may agree to recruit, train, and reimburse participants.

Other Efforts to Deal With the Maintenance Backlog

The Forest Service also receives monetary contributions through state cooperative programs and from organizations. In fiscal year 1988, according to the questionnaire respondents, the Forest Service received trail maintenance and construction contributions of about $2.4 million through state cooperative programs and about $124,000 from clubs, user groups, and businesses.

The state programs generally involve trails for motorized use, such as all-terrain vehicles or motorcycles. Funds come from vehicle registration

fees and rebates of highway gasoline taxes. These program funds are distributed by the states either directly to the Forest Service or, more commonly, through arrangements whereby trails are placed under special use permits to counties, municipalities, or clubs, and the states grant funds to the holders of the special use permits.

User groups and clubs also raise money for trail maintenance and construction. For example, the Rampart Range Motorcycle Management Committee (in Colorado), in conjunction with the Forest Service, has solicited and collected voluntary donations from users of the motorized vehicle trails in Pike National Forest's Rampart Range. Between January and mid-June 1988, according to a Service official, the motorcycle club's management committee collected about $5,000 in trail maintenance donations. Additionally, the club sells maps of the Rampart Range's motorized trails to raise money for trail maintenance.

The Service also uses a challenge, cost-share program to obtain maintenance and construction money, materials, and labor from organizations. Beginning with a 1988 pilot program, the Forest Service uses this program in part to help reduce the maintenance and reconstruction backlog. Organizations pledge to contribute cash, materials, and labor in return for a certain level of Forest Service expenditures—all of which go toward maintenance and reconstruction of Forest Service recreation facilities, including trails. Participating organizations or partners include state and local governments, private interest groups, correction facility inmates, schools, and businesses. In fiscal year 1988, the Congress appropriated $500,000 for a challenge, cost-share program for recreation programs nationwide, including trails. This appropriation, according to the Service, was more than matched by the partners, who pledged $908,000 in contributions of cash, materials, and labor to fund 30 projects, including trails.

For example, the Summit County Trail System Partnership (in Colorado) received $84,500 in partner contributions and $35,000 in Forest Service funds. The partnership project funds were to be used to improve biking, walking, and snowmobile trails in the Arapaho National Forest. In another challenge, cost-share project, the Appalachian Mountain Club (in New Hampshire) matched the Forest Service's funding of $6,000. The project funds were to be used in part to correct hazardous deterioration of the Ethan Pond Trail, a segment of the Appalachian Trail.

Because of the 1988 pilot program's success, the Congress increased the challenge, cost-share appropriation for recreation programs to $3 million in fiscal year 1989. Of that amount, $500,000 is for trail maintenance projects; the remainder is for a variety of recreation projects, including trail construction, and recreation facilities.

Costs and Limitations of Using Volunteers

Volunteer programs and other programs are helpful, but they have costs associated with them, such as the amount of time needed to train and supervise the volunteers. According to Service officials, not enough Forest Service personnel are available to train and supervise volunteers. As a result, many forest units have had to turn down volunteer offers or limit volunteer programs. About 70 percent of the questionnaire respondents said they had to limit the number of volunteers accepted for trail work because of the limited number of Service personnel available to plan work and to train and supervise volunteers.

According to an official of the Coronado National Forest, Arizona, each volunteer needs about 2 hours of supervision per week. Without supervision, volunteers can cause trail damage or exacerbate existing damage. In the Coronado National Forest, for example, a trail had been maintained by a local group of volunteers. Without supervision, the volunteers had lined the outside trail edge with rocks. While the effect was aesthetically pleasing, the rocks created a potential waterway along the trail and had to be removed.

The Service also incurs other costs when using volunteers. For example, in some cases, the Service pays for transportation, lodging, meals, and incidental expenses to attract volunteers. In the Gifford Pinchot National Forest, Washington, for example, local volunteers receive $5 per day for lunch and may receive mileage reimbursement. Out-of-town volunteers receive a daily expense allowance, and the Service may furnish housing.

In addition to these costs, there are also other limitations. For example, the quality of volunteers' work is uneven, and they generally cannot do heavy maintenance or reconstruction work. Unless the volunteers have considerable time, experience, and skill, they generally cannot build new trails, relocate trails, or construct bridges or rock steps. Additionally, volunteers cannot often be relied on for permanent commitments. Many volunteers donate a day or less of their time, and their interest sometimes dwindles after an hour or two of work.

Further, volunteers are available primarily near urban areas, so maintenance work in remote locations must be done by Service personnel. For example, the Coronado National Forest, located near Tucson, Arizona, reported 116 miles of trails maintained through about 5,955 volunteer hours in fiscal year 1988. In contrast, the Bighorn National Forest in Wyoming, near the less populous city of Sheridan, reported only 5 miles of trails maintained through 500 volunteer hours in fiscal year 1988. Similarly, the Pacific Southwest region, which essentially encompasses the state of California, reported that 1,600 miles of trails were maintained through 237,078 volunteer hours. However, the Alaska region reported only 81 miles of trails maintained through 12,415 volunteer hours.

Planned New Trail Construction

In addition to its trail maintenance and reconstruction needs, the forest supervisors told us that through its forest management plans, nearly 8,400 miles of new trails were planned for construction over the next 5 years. Essentially, the need for new trails on Forest Service land is determined either by the Congress or by the Service. The Congress designates new National Historic and National Scenic Trails, some of which are on Forest Service land. The Service identifies other new trail needs in national forests, relying heavily on trail users' requests in doing so.

The total estimated cost to construct the new forest trails is nearly $60 million. Per trail, however, construction costs vary depending on location, trail type, and planned structures on the trail. Once built, the new trails will also require maintenance. According to the Forest Service, about 75 to 80 percent of the trail construction budget is currently spent on reconstruction work on existing trails. If this allocation continues in the future, given current funding levels, only about one-third of construction costs estimated for the next 5 years will be available to build new trails.

National Trails Are Congressionally or Agency-Designated

The national trail system, established by the National Trails System Act of 1968 (P.L. 90-543), as amended, consists of three types of trails: national historic, national scenic, and national recreation.[1] National historic and scenic trails are designated by the Congress; national recreation trails are designated by the Secretary of the Interior or, if within national forests, by the Secretary of Agriculture. Some of the national trails are long and cross federal, state, and private lands. Among the best known national scenic trails, for example, is the Appalachian Trail, which covers about 2,000 miles, from Maine to Georgia.

Of the 8,400 miles of new trails that the forest supervisors said were planned for national forests over the next 5 years, about 400 miles are national scenic or national historic trails designated by the Congress. In most cases, before designating national scenic and historic trails, the Congress authorizes studies of the designation's desirability and feasibility. These studies are directed by Interior's National Park Service, in consultation with other federal agencies and interested state and local government agencies, public and private organizations, landowners, and

[1]The legislation also provides for the designation of connecting and side trails. As of June 1988, however, none of these had been designated.

land users. To be eligible for designation as a national scenic trail, a proposed trail route must be located so as to provide for maximum outdoor recreation potential and for conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the area through which it passes. To be eligible for designation as a national historic trail, a proposed trail route must have been established by historic use, must be historically significant with respect to a broad facet of American history, and must have significant potential for public recreational use on the basis of historic interpretation and appreciation.

The Forest Service Identifies New Trail Needs Within National Forests

The Forest Service identifies the need for other new trails (including national recreation trails) within the national forests. Each forest's administrative unit determines its need for new trails as part of its forest management plan. These management plans, in accordance with legislative requirements, identify each forest's investment needs for a 10- to 15-year period, including new trail needs designated by both the Congress and the Service.[2] New trail needs are based on several factors, including input from user groups and perceptions of Service management (e.g., overuse of current trails, forest management, and fire-fighting needs). Of the 8,400 new trail miles that the supervisors said were planned for the next 5 years, about 8,000 were identified through the planning process.

Figure 4.1 shows the basis on which the questionnaire respondents identified their new trail needs for fiscal years 1989 through 1993.

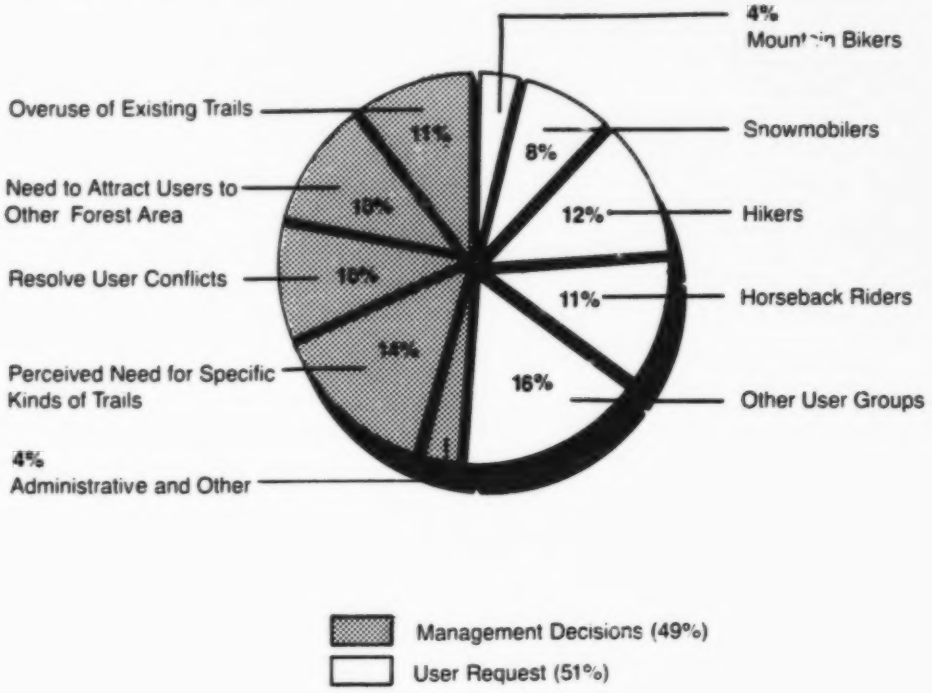
Types and Costs of New Forest Trails Planned

According to the questionnaire respondents, nearly 8,400 miles of trails are planned to be constructed over the next 5 years (fiscal years 1989 through 1993), at a total cost of about $60 million.[3] Only about one-third of the planned new trail miles may be built, however, because of funding limitations. For example, in fiscal year 1989, funding for new trail construction was about $16 million, but according to the Forest Service, about 75 to 80 percent of the construction funds are used for reconstruction of existing trails. Given this funding distribution, no more than about $4 million would be available for new trail construction during the

[2]Preparation of the forest plan is required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), as amended by the National Forest Management Act of 1976 (P.L. 94-588).

[3]The total estimated construction cost may be low: 119 respondents provided planned construction miles, but only 110 provided cost estimates.

Figure 4.1: Planning Basis for New Trails—Fiscal Years 1989 Through 1993[a]



[a]Congressionally designated trails are not included.
Source: Forest supervisors' responses to GAO's questionnaire.

year. If the fiscal year 1989 trail construction funding level and distribution pattern continues, the Forest Service will only have about $20 million (or about one-third of that $60 million needed) to build the new trails planned for the next 5 years.

Over 76 percent of the total new trail miles planned are in 4 of the 9 Forest Service regions. Table 4.1 shows, by region, the new trail miles planned for fiscal years 1989 through 1993.

Table 4.1: Planned New Trail Construction (Fiscal Years 1989 Through 1993)

Region numbers and name	New miles planned	Percent of total
1-Northern	706	8
2-Rocky Mountain	488	6
3-Southwestern	262	3
4-Intermountain	367	4
5-Pacific Southwest	1,177	14
6-Pacific Northwest	2,638	32
8-Southern	1,474	18
9-Eastern	1,142	14
10-Alaska	122	1
Total	**8,376**	**100**

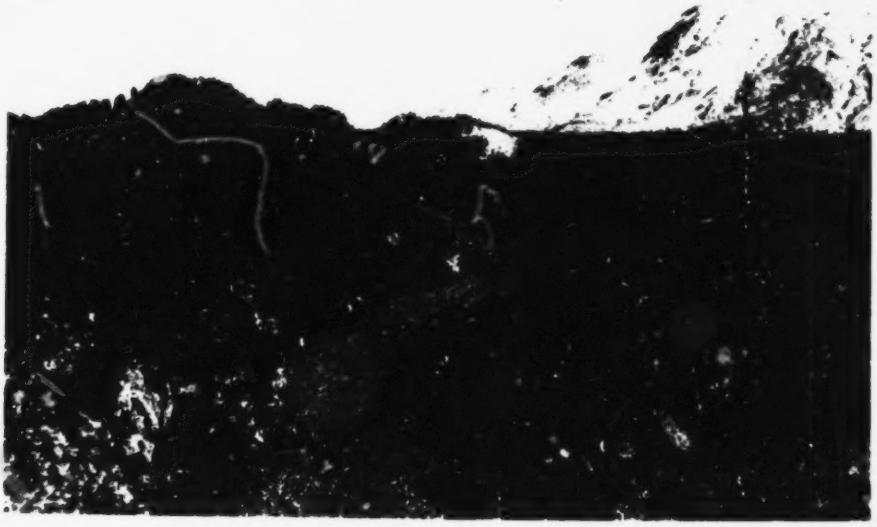
Construction costs vary by trail, depending on location. For example, trails in designated wilderness areas are usually more expensive to construct than trails located in nonwilderness areas because the cost of transporting materials is higher, and mechanized equipment in wilderness areas is generally prohibited. Over the next 5 years, according to the questionnaire respondents, about 709 miles of trails are planned to be constructed in designated wilderness areas.

Figures 4.2 and 4.3 show examples of new trail construction.

Construction costs also can vary depending on the type of trail to be built. Trails accessible to the handicapped, for example, are generally more expensive to construct than are general-purpose trails because they generally require a permanent, smooth surface (wood, asphalt, or concrete). (See fig. 4.4.) About 159 new miles of trails accessible to the handicapped are expected to be built during the next 5 years, according to the questionnaire respondents. Respondents who provided both mileage and cost information estimated the average construction cost per mile to be about $20,000 for these trails. At this cost, construction of the planned 159 miles of handicapped-accessible trails would cost about $3.1 million.

Interpretive trails, while usually less expensive than handicapped-accessible trails, are often more costly than general-use trails. (See fig. 4.5.) An interpretive trail is one that uses audio stations, brochures, or other means to provide information. The information discusses significant geologic, historical, or cultural facts about the surrounding area. An interpretive trail is usually less than a mile long and contains about 10 to 15 stops or signs. According to the questionnaire respondents,

Figure 4.2: A New Hiking Trail Constructed of Crushed Gravel, Gifford Pinchot National Forest, Washington



about 217 miles of interpretive trail miles are expected to be constructed over the next 5 years. Respondents who provided both mileage and cost information estimated the average construction cost per mile to be about $16,000 for these trails. At this cost, construction of the planned 217 miles of interpretive trails would cost about $3.5 million.

Figure 4.3: New Cable Suspension Bridge, Daniel Boone National Forest, Kentucky

Figure 4.4: A Barrier-Free Trail Accessible to the Handicapped, Cibola National Forest, New Mexico

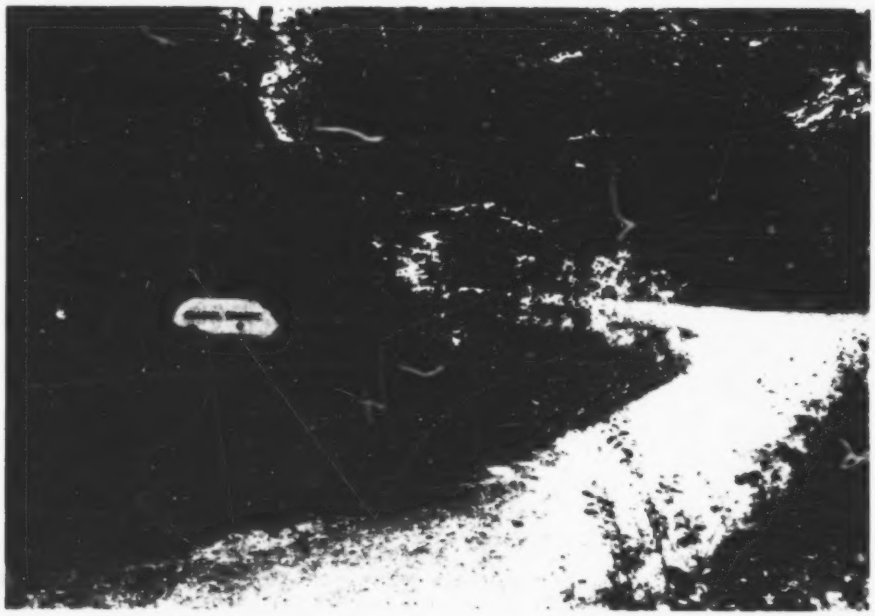


Figure 4.5: An Interpretive Nature Trail, White Mountain National Forest, New Hampshire

Conclusions

The trail maintenance and reconstruction backlog may prevent the Service from constructing, over the next 5 years, all of the 8,400 miles of new trails planned. If the Service continues to use 75 to 80 percent of its construction funds for reconstruction work, much of which is necessitated by priority maintenance needs, then most of the $60 million needed to build the new trails will not be available. In fiscal year 1989, funding for trail construction was about $16 million. Were the Service to use $12 million, or 75 percent, of that for reconstruction work, then only about $4 million would remain for new trail construction. Assuming no changes in funding levels and distributions, only about $20 million of the $60 million needed for new trail miles planned for the next 5 years will be available during that period.

Information on Trail Rights-of-Way

To ensure permanent access to forest trails, the Forest Service tries to obtain rights-of-way from landowners when trails cross private land, when access to trails is through private land, or when protection of the property is vital to preserve the scenic value of national trails. We obtained the following information on the status of rights-of-way that the Forest Service has identified for its trail program.

Rights-of-Way Obtained Over Last 3 Years

According to estimates we obtained from Forest Service headquarters, the Service acquired 124 rights-of-way comprising about 75 miles at a cost of about $3.4 million between 1986 and 1988. Table I.1 shows these acquisitions by region.

Table I.1: Trail Rights-of-Way Acquisitions, Miles, and Costs, (Calendar Years 1986 Through 1988)

Region number and name	Rights-of-way acquired	Miles acquired	Cost
1-Northern	14	9.0	$2,338
2-Rocky Mountain	3	2.0	0
3-Southwestern	1	.1	1,500
4-Intermountain	3	1.0	500
5-Pacific Southwest	32	48.6	15,240
6-Pacific Northwest	4	.8	821
8-Southern	54	2.0	3,363,236
9-Eastern	12	10.4	10,060
10-Alaska	1	1.0	0
Total	**124**	**74.9**	**$3,393,695**

Rights-of-Way Needed

As of September 30, 1988, questionnaire respondents reported a total of 1,398 rights-of-way were needed: 1,076 (or about 77 percent) for existing trails and 322 for planned trails. Table I.2 shows, by Forest Service region, the number of rights-of-way needed for existing and planned trails.

Table I.2: Rights-of-Way Needed

Region number and name	Rights-of-way needed: For existing trails	Rights-of-way needed: For planned trails	Total
1-Northern	225	24	249
2-Rocky Mountain	307	24	331
3-Southwestern	75	4	79
4-Intermountain	116	15	131
5-Pacific Southwest	147	24	171
6-Pacific Northwest	72	32	104
8-Southern	56	121	177
9-Eastern	68	77	145
10-Alaska	10	1	11
Total	**1,076**	**322**	**1,398**

Problems in Obtaining Trail Rights-of-Way

Seventy-six percent of the questionnaire respondents reported having experienced problems obtaining trail rights-of-way between fiscal years 1984 and 1988. These respondents reported a total of 855 rights-of-way problems: 385 at the beginning of trails and 470 along trails.

The Forest Service generally obtains rights-of-way through fee title acquisitions and easements. In a fee title acquisition, the government buys the land. In an easement, the government purchases a partial interest in the land, with certain rights, but the landowner retains the title.

Landowners are sometimes reluctant to negotiate easement rights-of-way or to sell their land. In some cases, landowners' reluctance can stem from the risk of theft, fire, or vandalism, as well as liability for accidents occurring on their land (in the case of easements). In other cases, landowners are reluctant to part with family property. Granting rights-of-way can entail additional expenses for landowners, such as the need to fence off a newly sold area. According to Forest Service personnel, some landowners refuse to grant rights-of-way because they harbor a general dislike toward the federal government. Other landowners, hoping to be offered a higher price, refuse to sell rights-of-way for the appraised value.

The Service can sometimes overcome landowners' reluctance. For example, a Service official in the Apache-Sitgreaves National Forest, Arizona, noted that the Service successfully obtained a right-of-way after lengthy negotiations with the landowner. The Service sought a half-mile easement for the Baldy Wilderness Trail. The land was owned by the Apache

Tribe, which did not want the public to use its land. The Service began negotiating with tribal officials in 1974 and, after about 2 years, convinced tribal officials that the public and the tribe had a mutual interest in the land. The tribe agreed to grant the easement, at no cost to the Service.

Generally, acquiring a right-of-way takes about 3 years from the identification of need to the actual acquisition. Planning and surveying the land needed can take 6 months to a year. Landowner negotiations and court proceedings, if necessary, can then take up to 2-1/2 years.

The acquisition time can increase substantially when the Service acquires a right-of-way through condemnation proceedings. When landowners refuse to grant a right-of-way, the Service can obtain one through its eminent domain authority, as authorized by the 1968 National Trail System Act (P.L. 90-543), as amended.

However, the Service's general policy has been to use condemnation proceedings as a last resort, as they carry a negative connotation and can be costly and time-consuming. According to the questionnaire respondents, five trail rights-of-way were obtained through condemnation proceedings from fiscal years 1984 through 1988.

A case cited by officials of the Pisgah National Forest, North Carolina, illustrates the time and cost involved in using condemnation to obtain a right-of-way. The right-of-way sought involved about 59 acres of land abutting the Appalachian Trail. The Forest Service considered the acquisition critical to avert development of the property and preserve the scenic value of the Appalachian Trail.

Negotiations to acquire the property on a voluntary basis began in the late 1960s. The landowners, five heirs to the property, rejected repeated attempts by the Forest Service to discuss a purchase because they wanted to keep the property in the family. For approximately the next 10 years, the Service attempted to negotiate a right-of-way, through either an easement or a fee title acquisition, with the landowners. In 1983, Service officials began discussing whether to use condemnation proceedings to obtain the right-of-way. In 1985, the Chief of the Forest Service recommended initiating condemnation proceedings, and in 1986, the U.S. Attorney filed the civil complaint in U.S. District Court. In 1987 a judgment was signed giving the Service control of the property and awarding the landowners $240,000 for the property involved. This

award was nearly double the federal government's appraised land value of $128,500.

When the Forest Service is unsuccessful in persuading the landowner to grant a right-of-way, it sometimes decides to reroute a trail, which may entail temporary trail closure, rather than continuing to negotiate with the landowner or entering into lengthy condemnation proceedings. Nearly 60 percent of the questionnaire respondents said that the lack of rights-of-way had caused partial or full trail closures in fiscal years 1984 through 1988.

Examples of Trail Design and Maintenance Standards

The amount, frequency, and type of trail maintenance varies by trail type and takes into account many factors including: users, topography, climate, and the volume of traffic. The Service's Trails Management Handbook (Forest Service Handbook 2309.18) provides general design considerations and trail construction and maintenance guidelines. Regional offices may issue supplemental guidelines, on the basis of their topography, climate, and other considerations.

Described below are examples of trail design standards, maintenance standards, and related activities used by the Service's Southern region. Recreational trails in the Southern region are classified by the following experience/maintenance levels:

Level 1. Trails maintained for primitive experience level. Custodial care only. No tread (trail surface) maintenance unless drainage not functional and likely to fail. Trail sides not brushed, but tread kept passable. Small slides may remain except for erosion potential. Structures maintained as needed. Signing (directions) may be deferred.

Level 2. Trails maintained for near-primitive (semiprimitive) experience level. Tread maintained for public safety. Logs or similar rustic structures may be provided at stream crossings. Drainage same as level 1. Signing at a minimum level commensurate with the level of trail use or complexity.

Level 3. Trails maintained for intermediate experience level. Tread maintained for public safety and user convenience. Drainage same as level 1. Trail sides brushed out to prescribed standard. Structures maintained to original design standards. Signing same as level 2.

Level 4. Trails maintained for concentrated use, at relatively high standards, to provide for public safety, convenience, and comfort. Tread kept relatively smooth, firm, and stable. Litter should be picked up frequently. Signing at high level. All other elements same as level 3. These trails are generally maintained to accommodate family or senior citizen use.

Level 5. Trails maintained for high use (modern-urban) experience levels, including special purposes such as bicycle trails, trails to major vista points, and trails for the handicapped. Basic care same as level 4, but patching of paved tread may be needed annually. Trail sides maintained to meet high visual quality standards by brushing trail sides and

cleaning up debris beyond the trail limits. Native plants may be planted for traffic control and aesthetic purposes. Vistas are maintained.

Table II.1 provides ranges on design standards by trail type for degrees of grade, trail clearance, minimum tread width, and bridge width. Table II.2 provides specification for trail maintenance.

Table II.1: Trail Design Standards

	Degree of grade	
Trail type	**Preferred**	**Maximum**
Hiking	1 to 7	15
Horse	1 to 7	10
Bicycle	1 to 3	6
Interpretive	1 to 4	8
Handicapped	0 to 3	5
Trail bike	1 to 10	50
	Trail clearance	
Trail activity	**Width**	**Height**
Hiking (level 1)	a	a
Hiking (level 2)	4 feet	8 feet
Hiking (levels 3, 4, 5)[b]	6 feet	8 feet
Horseback (except level 1)	8 feet	10 feet
Trail bike	6 feet	8 feet
Bicycle	8 feet	8 feet

[a]Clearing adequate to delineate trail.

[b]Includes interpretive and handicapped trails.

Trail activity	**Minimum tread width**
Hiking (levels 1, 2, 3)	18 inches
Hiking (levels 4, 5)	24 inches
Horseback	24 inches
Trail bike	24 inches
Bicycle	24 inches
Interpretive	24 inches
Handicapped	36 inches
Experience level	
Bridge width	
1 & 2	12 inches
3	18 inches
4 & 5	30 inches

Table II.2: Trail Maintenance Standards

Maintenance level	Brushing requirements		
	Width	Height	Frequency
1	4 feet	10 feet	2 years
2	4 feet	10 feet	2 years
3	6 feet	10 feet	1 year
4	6 feet	10 feet	1 year
5	8 feet	10 feet	1 year

Maintenance level	Logging out activity	Frequency
1	Clear path to protect resource or remove impassable obstruction.	2 years
2	Remove section of log over tread (48 inches wide for horses) or notch sufficiently to allow passage.	2 years
3	Remove section within clearing limits and dispose locally.	1 year
4	Remove tree and dispose of all debris away from trail.	1 year
5	Same as level 4.	1 year

Maintenance level	Tread maintenance activity	Frequency
1	Correct resource damage only, resulting from erosion or landslide.	2 years
2[a]	Correct safety deficiencies, such as potholes, large debris on trail, or unstable outslopes.	2 years
3[a]	Maintain user convenience by removing general debris such as loose rock from trail, and fill rutted areas caused by saddle stock or motor vehicles.	1 year
4[a]	High-standard tread is smooth and firm. Turnpike or surface as necessary.	1 year or less
5[a]	Patch paved tread. Sweep or rake clear of all debris and litter.	1 year or less

Maintenance level	Drainage maintenance activity	Frequency
1	Restore functional drainage (outslopes). Correct gully erosion situations.	2 years
2[a]	Repair waterbars and reinforced dips. Install additional structures when needed.	2 years
3[a]	Clear or replace pipes, ditches, and culverts. Repair erosion damage at outlets.	1 year
4[a]	Restore rock-lined ditches and other wet areas.	1 year or less
5[a]	Repair paved drainage channels and sub-surface structures.	1 year or less

Maintenance level	Structure maintenance activity	Frequency
1	Replace or repair primitive log bridges and stepping stones. Remove accumulated flotsam at crossing.	2 years
2	Repair damaged structural elements of rustic bridges, such as pilings, stringers, handrails, and decking. Repair fence gates and stiles.	2 years
3	Restore structural components of bridges, gates, and stiles to sound condition. Repair convenience structures, such as shelters, fire rings and other accessories to original design standards.	1 year
4	Same as level 3, plus replace unsightly materials and paint or stain surfaces as required. Remove graffiti.	1 year or less
5	Same as level 4, plus repair damaged or loose masonry.	1 year or less

Maintenance level	Sign maintenance activity	Frequency
1	Signing often deferred. Where used, restore to serviceable condition. Repaint blazes as needed. Restack cairns.	2 years
2	Repair or replace trail guide signs to meet standard. Tighten signs, align posts, clear vegetation from signs. Repair or replace road junction, trail-head, and regulatory signs. Repaint blazes and special markers as needed.	2 years
3	Same as level 2, plus repair or replace informational, interpretive, and other feature signs.	1 year
4	Same as level 3, plus repair or replace special 1-year purpose trail signing (e.g., nature trail or photo trail). Remove graffiti.	1 year or less
5	Same as level 4, plus repair or replace signing related to use by handicapped.	1 year or less

[a]Each succeeding level of maintenance incorporates all preceding activities.

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Budget History: Total Forest Service, Trail Maintenance, and Trail Construction for Fiscal Years 1980 Through 1989

(In thousands of constant FY 1989 dollars)

	Fiscal Years			
Budget item/level	**1980**	**1981**	**1982**	**1983**
Forest Service total:				
Agency Request	$1,608,546	$1,511,336	$1,381,121	$1,377,672
Dept. Allowance[1]	1,200,247	1,138,950	1,287,166	1,353,700
President's Budget	1,127,642	1,179,323	1,071,305	1,264,109
Appropriations	1,237,679	1,200,019	1,226,892	1,232,239
Trail maintenance				
Agency Request	34,183	26,030	23,034	14,017
Dept. Allowance	16,465	17,326	19,487	14,017
President's Budget	17,129	18,675	11,312	9,494
Appropriations	17,129	18,675	17,362	11,933
Trail construction				
Agency Request	23,453	33,019	24,862	5,932
Dept. Allowance	11,846	8,049	7,195	5,932
President's Budget	12,243	4,812	2,538	5,932
Appropriations	12,219	4,812	5,747	5,932

Fiscal Years					
1984	1985	1986	1987	1988	1989
$1,357,927	$1,270,884	$1,260,201	$1,271,229	$1,273,296	$1,295,125
1,264,245	1,209,588	1,238,023	1,130,597	1,233,519	1,237,376
1,126,589	1,181,047	1,186,385	960,782	1,058,768	1,159,655
1,144,975	1,190,979	1,195,456	1,244,140	1,295,199	1,329,488
11,499	11,223	11,402	15,306	15,951	22,776
10,325	9,554	9,571	10,559	15,951	15,636
9,580	9,541	10,439	8,985	12,006	15,636
10,754	10,466	11,051	11,815	20,860	20,797
6,082	6,274	7,063	8,313	15,860	13,777
6,082	6,003	7,063	7,599	14,298	13,777
6,082	5,995	3,853	5,345	7,317	12,643
6,082	8,108	7,797	7,842	15,282	15,947

[1]Department of Agriculture Allowance

Source: Basic data provided by the Forest Service

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.	James R. Hunt, Assistant Director Charles F. Barchok, Assignment Manager
Denver Regional Office	Douglas H. West, Regional Management Representative William J. Temmler, Evaluator-in-Charge Valerie P. Garth, Evaluator Felicia A. Turner, Systems Analyst Pamela K. Tumler, Reports Analyst

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